Supporting Information

Contribution of first- versus second-generation products to secondary organic aerosols formed in the oxidation of biogenic hydrocarbons

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Other compounds with multiple double bonds

Good correlations between aerosol growth and the amount of reacted intermediate products are also observed in the following systems: myrcene ozonolysis, myrcene photooxidation, γ-terpinene photooxidation, and linalool photooxidation.

Myrcene ozonolysis and photooxidation produce 4-vinyl-4-pentenal (MW=110) (*1*, *2*). For myrcene ozonolysis, the m/z 93 and m/z 111 ions have the same time evolutions, so the m/z 93 ion is probably the dehydrated fragment of the m/z 111 ion. The total molar yield is 0.53. The correlation with aerosol growth is shown in Figure S1. However, these two ions show very different time evolutions in the myrcene photooxidation experiment. The m/z 93 ion has a molar yield of 0.34, and has a good correlation with aerosol growth as shown in Figure S2. The yield of m/z 111 is 0.09, which is too low to obtain a good correlation. For myrcene photooxidation, the unidentified ion m/z 113 has a yield of 0.36 and the correlation with aerosol growth is shown in Figure S3.

For linalool photooxidation, we assume that m/z 111 and m/z 93 are dehydrated fragments of m/z 129 (as they have similar time evolutions), which is probably 4-hydroxy-4-methyl-5-hexen-1-al (MW 128) as identified in other studies (*3*). The total yield of m/z 129 is 0.74, and the correlation between the amount of m/z 129 ion reacted and aerosol growth is shown in Figure S4.

For γ-terpinene photooxidation, we observed a correlation of aerosol growth and m/z 153 and m/z 169 (γ-terpinaldehyde) as shown in Figures S5-S6.

References

(1) Hakola, H.; Arey, J.; Aschmann, S. M.; Atkinson, R. Product formation from the gas-phase reactions of OH radicals and O_3 with a series of monoterpenes. *J. Atmos. Chem.* **1994**, *18*, 75-102.

(2) Reissell, A.; Aschmann, S. M.; Atkinson, R.; Arey, J. Products of the OH radical- and O_3-initiated reactions of myrcene and ocimene. *J. Geophys. Res.* **2002**, *107*, 4138, doi:10.1029/2001JD001234.

(3) Shu, Y.; Kwok, E. S. C.; Tuazon, E. C.; Atkinson, R.; Arey, J. Products and gas-phase reactions of linalool with OH radicals, NO_3 radicals, and O_3. *Environ. Sci. Technol.* **1997**, *31*, 896-904.

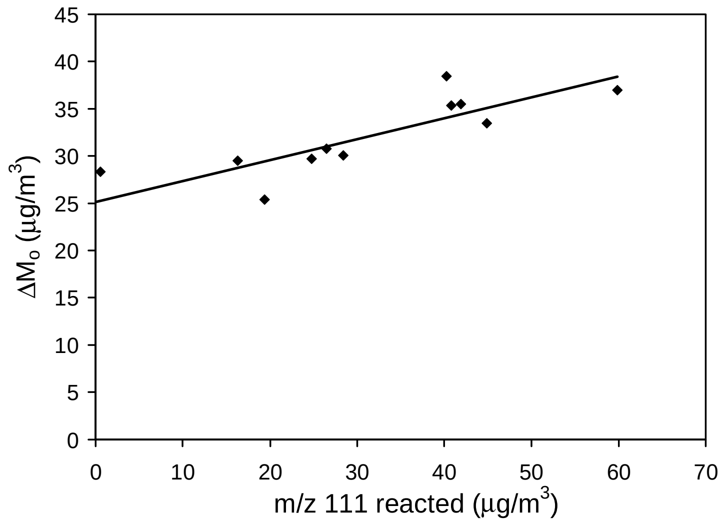

Figure S1: SOA mass formed as a function of the amount of the intermediate product m/z 111 (include the dehydrated fragment m/z 93) reacted for myrcene ozonolysis

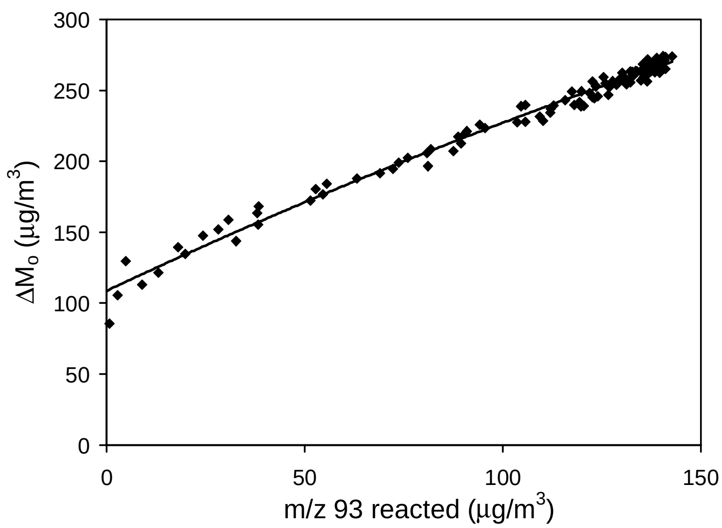

Figure S2: SOA mass formed as a function of the amount of the intermediate product m/z 93 reacted for myrcene photooxidation

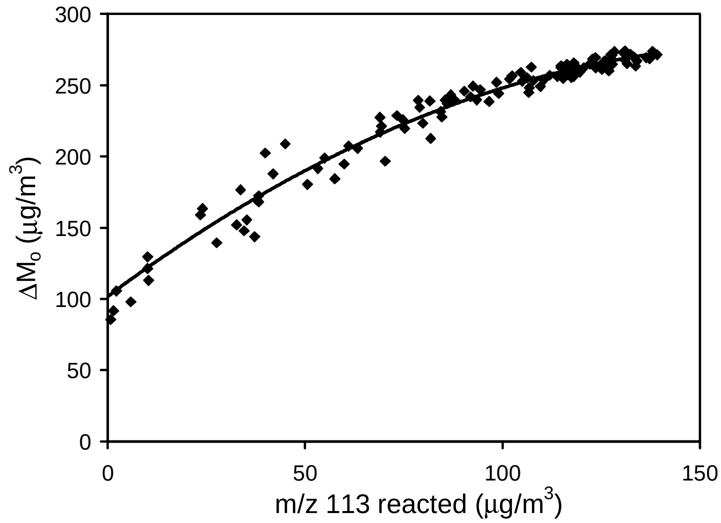

Figure S3: SOA mass formed as a function of the amount of the intermediate product m/z 113 reacted for myrcene photooxidation

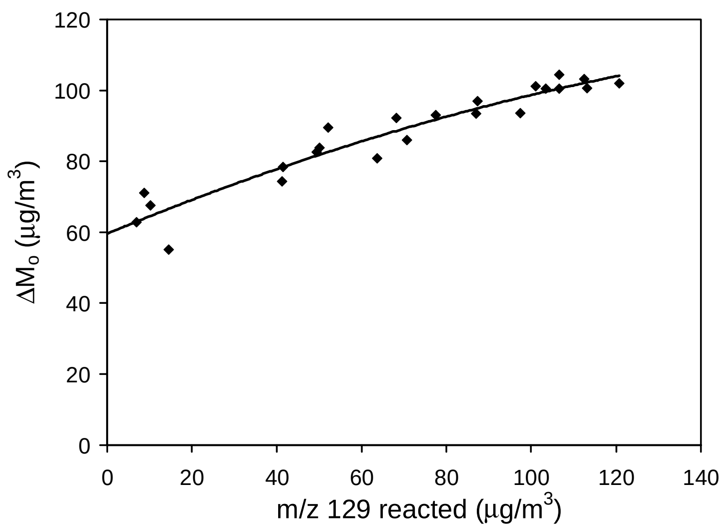

Figure S4: SOA mass formed as a function of the amount of the intermediate product m/z 129 reacted for linalool photooxidation

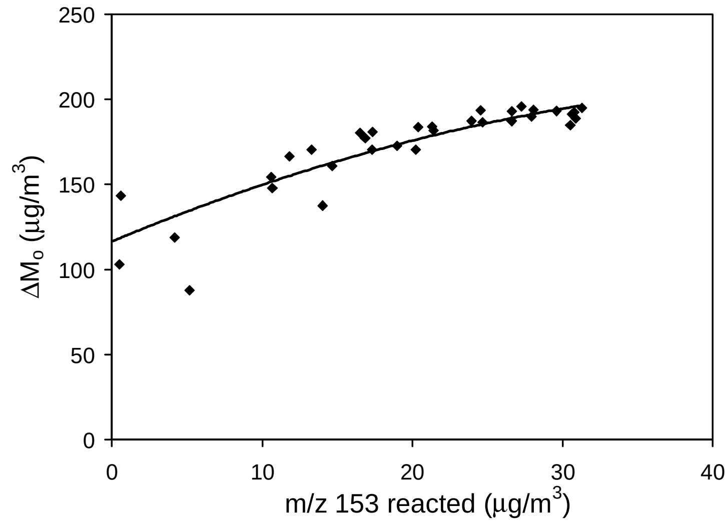

Figure S5: SOA mass formed as a function of the amount of the intermediate product m/z 153 reacted for γ-terpinene photooxidation

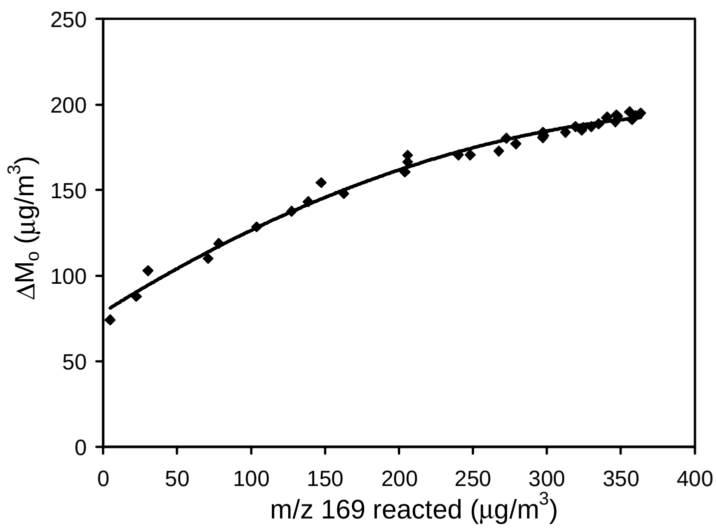

Figure S6: SOA mass formed as a function of the amount of the intermediate product m/z 169 (including its fragments and isotopes) reacted for γ-terpinene photooxidation